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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: JEAN-PAUL CANO ET AL.

Filed: FEBRUARY 7, 2001

For: OPTHALMIC LENS MADE OF ORGANIC GLASS WITH SHOCKPROOF INTERMEDIATE LAYER; AND METHOD OF MAKING SAME

Serial No.: 09/778,464

Group Art Unit: 1773

Examiner: NAKARANI, DHIRAJLAL S.

Atty. Dkt: ESSI:005CP1

Pursuant to 37 C.F.R. 1.8, I certify that this correspondence is being deposited with the U.S. Postal Service in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date below:

9/8/05 Date

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APPEAL BRIEF

Dear Sir:

Pursuant to 37 C.F.R. 1.192 and further to the Notice of Appeal received by the US Patent Office on July 11, 2005, Appellant submits this Appeal Brief in triplicate to the Board of Patent Appeals and Interferences. The requisite filing fee is submitted with this Brief. Appellant submits that the Examiner erred in twice rejecting the claims, and respectfully requests this Honorable Board to reverse the rejection.

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(1) <u>Real Party in Interest</u>

The real party in interest is the assignee, Essilor International Compagnie Generale D'Optique.

(2) <u>Related Appeals and Interferences</u>

Appellant is unaware of any pending appeal or interference which affects this appeal.

(3) <u>Status of Claims</u>

Claims 1-26 are pending in this application and are on appeal having been twice rejected.

(4) <u>Status of Amendments</u>

The appealed claims are under final rejection. An amendment after final was submitted to delete the term "or an acrylic based coating" in the last line of claim 1. While this amendment simply limited the scope of claim 1 and reduced issues on appeal, the Examiner asserted that new issues were raised, and the Examiner did not enter the amendment either before or after appeal.

(5) <u>Summary of Invention</u>

This invention concerns an opthalmic lens and a process for making an ophthalmic lens. The ophthalmic lens consists of a substrate made of organic glass, of an abrasion-resistant coating, of a layer of impact-resistant primer and of an anti-reflective coated. The surface of the substrate is covered with the abrasion-resistant layer and the anti-reflective coating. The abrasion-resistant coating is a silicone based

coating or an acrylic based coating. See, e.g., the Summary of Invention, which begins at page 2 of the specification.

(6) Issues

The first issue on appeal is whether the Examiner has properly rejected claims 1-26 under §112, first paragraph with respect to the phrases "abrasion-resistant coatings" and "anti-reflective coatings".

The second issue on appeal is whether the Examiner has properly rejected claims 1-3, 5, 6, 10, 11, 13, 15, 18, and 20-24 under §103(a) as being unpatentable over Taniguchi et al. (U.S. Patent No. 4,904,525).

(7) Grouping of Claims

For purposes of this appeal, claims 1-26 constitute a single group.

(8) Argument

A. The §112, Paragraph 1 Should be Reversed

Claims 1-26 were rejected under §112, first paragraph, with respect to the "abrasion-resistant coatings" and "anti-reflective coatings." <CR>

The Examiner stated that:

> Claims 1-23, 25 and 26 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the (1) abrasion-resistant coating derived from composition of claim 12 and (2) an inorganic antireflective coating having monolayer with optical thickness of $\lambda/4$ where λ is a wavelength between 450 and 650 nm or having multilayer film comprising three layers with a combination optical thickness $\lambda/4.\lambda/2.\lambda/4$ or $\lambda/4.\lambda/4.\lambda/4$, respectively, or equivalent multilayer with similar optical thickness (see page 13, lines 21-29), does not reasonably provide enablement for any abrasion resistant coating and any antireflective coating (e.g., U.S. Patent 4,904,525 and Declaration of Philippe Roisin). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The specification as filed does not teach or suggest hard coating such as organic resin coating, inorganic coating etc. All coating has somewhat abrasion resistant. Addition of coating improves abrasion of stack over stack having no coating. The claimed invention does not claim minimum abrasion resistant. Also there is no disclosure of an antireflective coating other than inorganic."

(Office Action dated 3/22/04 at page 3 and Office Action dated 1/18/05 at page 3.) The Examiner has argued that the applicant's arguments were unpersuasive because "the Examiner has not stated that any abrasion resistant coating will improve the abrasion resistance. The Examiner has stated that any additional layer will provide improvement. Furthermore, there is no evidence provided showing that layer having low glass transition temperature and/or made of thermoplastic material or with low cross-linking will lower abrasion resistant of final product [sic]." (Office Action dated 3/22/05 at page 5 and Office Action dated 1/18/05 at page 5).

The Examiner errs.

It is black letter law that a statement in the specification as broad as the broadest claim satisfies the enablement requirement unless (1) the properly challenges the truth of the statement or (2) undue experimentation would be required to practice the invention as claimed. See In re Marzocchi, 169 USPQ 367 (1971) and In re Borkowski, 164 USPQ 642 (1970). The Examiner must do more than merely question operability or express doubts, and instead must set forth factual basis for doubting the applicant's assertions. In re Gaubert, 187 USPQ 664 (1975). Furthermore, the function of the claims is to set limits and not to teach in detail how to practice the invention. See, e.g., Ex parte Pontius et al., 169 USPQ 122 (1970).

In this case, the Summary of Invention and specification certainly contains a statement as broad as the broadest claim as to abrasion-resistant coatings and antireflective coatings. Rather than providing detailed reasoning to challenge the truth of the statement made in the specification, the Examiner has merely made a conclusory allegation for lack of enablement. Specifically, the Examiner asserted that

> While being enabling for the (1) abrasion-resistant coating derived from the composition of claim 12 and (2) an inorganic antireflective coating having monolayer with optical thickness of $\lambda/4$ where λ is a wavelength between 450 and 650 nm or having multilayer film comprising three layers with a combination optical thickness $\lambda/4.\lambda/2.\lambda/4$ or $\lambda/4.\lambda/4.\lambda/4$, respectively, or equivalent multilayer with similar optical thicknesses (see page 13, lines 21-29), does not reasonably provide enablement for any abrasion resistant coating and any antireflective coating (e.g., U.S. Patent 4,904,525 and Declaration of Philippe Roisin). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The specification as filed does not teach or suggest hard coating such as organic resin coating, inorganic coating etc. All coating has somewhat abrasion resistant. Addition of coating improves abrasion of stack over stack having no coating. The claimed invention does not claim minimum abrasion resistant. Also there is no disclosure of an anti-reflective coating other than inorganic.

(Emphasis added, Office Action dated 3/22/04 at page 3 and Office Action dated 1/18/05 at page 3.) However, items (1) and (2) are simply two embodiments described in the specification or claims.

For example, in item (1) the Examiner asserts that abrasion-resistant coatings are only enabled for compositions of claim 12. The Examiner ignores, however, the specification at page 10, line 11 through page 12, line 30 where the abrasion-resistant coatings are thoroughly described. Abrasion-resistant coatings are well known in the art.

Similarly, in item (2) the Examiner asserts that anti-reflective coatings are enabled having certain thickness and certain wavelength, pointing to page 13, lines 21-23. The Examiner also alleges that only inorganic anti-reflective coatings are enabled. Once again the Examiner ignores other portions of the specification. Anti-reflective coatings are described, for example, at page 12, line 31 through page 13, line 29. Anti-reflective coatings are well known in the art.

Thus, the Examiner has simply pointed to certain embodiments in the specification, asserts without any foundation that the claims should be limited to these embodiments, and then uses circular reasoning to explain the Examiner's basis for the §112, ¶1 rejection.

The Examiner's conclusory allegations certainly do not rise to the level of detail required by the relevant case law. It can be seen that the Examiner has done no more than allege the claim should be limited to the representative embodiments in the specification. Thus, the Examiner has not properly challenged the truth of statement and therefore fails the first prong of the tests identified above with respect to the relevant case law.

More specifically, with respect to the abrasion-resistant term, in stating that any coating will provide abrasion resistance, the Examiner fails to take into account the knowledge of one of skill in the art as well as the support in the specification for the term. The Examiner is incorrect in stating that *any* abrasion-resistant coating will improve the abrasion resistance of the final product. Thus, impact resistance enhancing layers having low glass transition temperature (Tg) and/or made of

thermoplastic materials or with low cross-linking will usually lower the abrasion resistance of the final product.

In addition, such coatings are well known by the skilled person. Further, a definition of abrasion-resistant coatings is given in the specification page 10, lines 14 to 16 ("...a coating which improves the abrasion resistance of a layer stack as compared to the same layer stack without the abrasion-resistant coating."), as well as other passages such as the very passages cited by the Examiner. These are believed to provide adequate support for the original claim language.

Also, the function of the abrasion-resistant coating of the invention is clearly defined since it must be a coating which enhances the abrasion resistance of the initial article. Please note that the abrasion resistance test is disclosed in the specification at page 15, lines 3 to 30. Consequently, a skilled person in the art has more than adequate disclosure and information needed to select an abrasion-resistant coating once the base substrate has been chosen.

Furthermore, several documents (US and EP patents) have been previously submitted that show that abrasion-resistant coatings are well known in the art. In particular, the following references have been previously brought to the attention of the Examiner: US Patents 3,968,309; 3,986,997; 4,199,421; 4,211,823; 4,294,950; 4,355,135; 4,500,669; and 5,049,321; EP 13 939, and EP 614 957. These references describe, for example, acrylic abrasion-resistant coatings and silicone type coatings. These documents also evidence the knowledge that one of ordinary skill in the art attributes to an abrasion resistant coating.

Moreover, the Examiner clearly failed to suggest that undue experimentation would be needed to practice the invention with respect to the abrasion-resistant coating term. Indeed, the Examiner does not appear to even discuss this second prong of the case law discussed above.

With respect to the anti-reflective term, the Examiner simply states that the specification supports only organic anti-reflective coatings. The Examiner's statement is merely conclusory.

What is more, the Examiner is incorrect in stating that only inorganic anti-reflective coatings are disclosed in the specification. Organic anti-reflective coatings are specifically mentioned at page 13, lines 13 to 20. Furthermore, examples 4, 5, and 6 concern such organic anti-reflecting coatings and disclose anti-reflective layers obtained from gamma-glycidoxypropyl trimethoxysilane, which contains an organic glycidoxy group which is not eliminated when preparing the layer and instead remains when the layer is cured. In addition, examples 4-6 show sol/gel processes entirely different from the vapour phase deposition used to obtain the purely inorganic layers of the other examples of the invention.

Finally, the Examiner clearly failed to suggest that undue experimentation would be needed to practice the invention with respect to the anti-reflective coating term. Indeed, the Examiner does not appear to even discuss this second prong of the case law discussed above.

Based on the description, in the Specification, it is submitted that a skilled artisan would be capable of practicing the claimed invention without undue experimentation.

In view of the foregoing, applicant respectfully requests that this Honorable Board reverse the §112, ¶1.

B. The §103 Rejection Should be Reversed

The Examiner rejected claims 1-3, 5, 6, 10, 11, 13, 15, 18, and 20-24 under §103(a) as being unpatentable over Taniguchi et al. (U.S. Patent No. 4,904,525).

The basis for the Examiner's rejection is as follows:

> Taniguchi et al disclosure and anti-reflection optical article such as an optical lens (col. 1, lines 10-12). Taniguchi et al.'s article comprises a substrate such as polystyrene, polycarbonates, etc. (col. 2, lines 37-44) coated with hard coatings (col.2, lines 55-65), a fluorine containing organopolysiloxane based film and second coat of fluorine containing organopolysiloxane based film having F/Si ratio less than 80% (col. 7, lines 59 to col. 8, line 43). The thickness of hard coat layer and first and second fluorine containing organopolysiloxane based film falls within the claimed range (see abstract, col. 3, lines 35-36, 46-51 and col. 8, lines 28-31). Taniguchi et al also disclose pretreatment such as chemical treatment (col. 8, lines 36-37), ion bombardment, oxygen plasma etc. (col. 6, lines 18-40) of hard coating coated article. Taniguchi et al. also disclose dip coating, spray coating etc. (see col. 9, line 48 to col. 11, line 30). Taniguchi et al. fail to disclose that hard coating is also abrasion resistant coating. However, in absence of claiming minimum level of required abrasion resistant, any hard coating deemed to have somewhat abrasion resistance. Taniguchi et al.'s second fluorine containing oganopolysiloxane based coating deemed to have some anti-reflective properties. Furthermore person of ordinary skill in the art would have found it obvious to adjust abrasion resistance and anti-reflective properties of respective layers for desired application.

(Office Action dated 10/11/02 at pages 3-4.)

In response to the applicants' responses to the rejection, the Examiner stated:

> Taniguchi et al's articles is an anti-reflection optical article. Further there is nowhere in the present application stated argued upper limit of R_m value to consider the coating as having antireflective properties. There is no data showing that the claimed invention has R_m values at or below 2.5%.

(Office Action dated 3/22/04 at page 5.)

The Examiner errs.

Taniguchi et al. discloses an anti-reflection optical article which comprises a substrate such as polystyrene and polycarbonates; a hard coating; a top film of fluorosilicone having an average Fe/Si ratio ranging from 0.02 to 10; and a second fluorine-containing organopolysiloxane-based film (1nm to 30nm thickness) having a F/Si ratio of less than 80% than that of the top film.

Tanaguchi et al. states that the second fluorosilicone film is an antistatic film.

In the rejection, the Examiner assumes that the second fluorosilicone film acts as an anti-reflective film and the fluorosilicone top film as an impact-resistant primer interlayer.

As demonstrated in the grandparent case and as explained herein, however, the second fluorine-containing organopolysiloxane based film of Taniguchi et al. cannot be considered as an anti-reflective layer.

In this regard, the Board's attention is directed to Annex 1 of applicant's response submitted on 4/11/03. A copy of Annex 1, which includes the ROISIN Declaration is attached hereto.

The stackings shown in annex 1 were modelized by applicants using commercial software "Film Star Design" of FTG Software Associates-Princetown New Jersey. Annex 1 includes the Declaration of ROISIN and related information that were submitted previously in the grandparent case.

Calculations were made using a light beam having an incident angle of 15°.

The modelized stacking were the following:

Stacking 1: corresponds to a reference stacking comprising a substrate and a hard coat according to example 1 of Taniguchi et al. but without the anti-reflective coating.

Stacking 2: corresponds to the stacking of example 1 of Taniguchi et al. and comprises substrate / hard coat / top film (anti-reflective film).

This stacking is said to have an experimental transmission of 96.1%.

Stacking 3: comprises substrate / hard coat / top coat of fluorosilicone (anti-reflective coating) / second fluorine containing organopolysiloxane based film (antistatic coating). Three thicknesses of the antistatic film were considered, namely 1 (a), 15 (b) and 30(c) nm.

Stacking 4: comprises substrate / hard coat / second fluorine containing organopolysiloxane-based film (antistatic film). Three thicknesses of second fluorosilicone film were considered, namely 1nm (a), 15nm (b) and 30nm (c).

Refractive index value of the second fluorosilicone film was estimated from f/Si ratio of 0.04/1.

Results:

For each stacking, mean reflexion values R_m (per face) (for the entire visible spectrum 400-700nm) and mean transmission value T_m were determined assuming that the two major faces of the substrate were coated with the corresponding layers.

	1	2	3a	3b	3c	4a	4b	4c	S
R_m(%)	5.06	1.30	1.31	1.63	2.28	5.06	4.85	4.24	5.47
T_m(%)	89.87	97.40	97.38	96.74	95.43	89.87	90.30	91.52	89.06

S corresponds to an uncoated substrate.

As specifically stated in the ROISIN Declaration,"For the skilled person, a coating which does not lower the reflexion value (per face) to at least 2.5% is not considered as an antireflective coating. This 2.5% value is the limit typically considered by the skilled persons as characterizing an anti-reflective coating, this value is the value that has been selected for defining an anti-reflective coating in the International standard ISO/DIS 8980-4 which is presently under discussion for approval." As has been stated of record, this International standard was adopted.

In view of the above comments and results, it is submitted that the second fluorosilicone film (antistatic coating) of Taniguchi et al. cannot be considered as an antireflecting coating since all stackings 4) include only the hard coat and the second fluorosilicone film have R_m values per face (namely at least 4%) much higher than 2.5% which is the upper limit value for considering the coating as having antireflective properties. Furthermore, stacking 3 shows that the presence of the second fluorosilicone film (antistatic) deteriorates the antireflective properties of the underneath antireflective top coating.

The fact that for stacking 2 (example 1 of the reference) the calculated value of T_m (97.4%) is higher than the experimental value (96.1%) given in Taniguchi et al. should not be surprising. In fact, there always exists slight variations since the actual stacking is usually not perfect contrary to modelized stackings. Further, modelized calculations were effected using an incident angle of 15° and integrating over the full 400-700nm range. In Taniguchi et al., other conditions may have been used.

Nevertheless, the above stacking modelization gives a meaningful comparison of the properties of the different stackings.

In conclusion, the antistatic second fluorosilicone film of the Taniguchi et al. is not an antireflective coating. In Taniguchi et al., the antireflective properties are attributable to the first fluorosilicone top coat.

Consequently, there is no disclosure or suggestion in Taniguchi et al. of an impact-resistant primer layer between a hard coat and an antireflective coating.

Furthermore, the skilled person cannot find in Taniguchi et al. any motivation for introducing between a hard coat and an antireflective coating an intermediate impact-resistant primer layer.

In the 3/22/04 office action, the Examiner stated that applicant's comments were not persuasive because

> Claims 1-21 are not rejected as stated in remark [sic] over Taniguchi et al. Taniguchi et al's articles is [sic] an anti-reflection optical article. Further there is nowhere in the present application stated argued [sic] upper limit of Rm value to consider the coating as having antireflective properties. There is no data showing that the claimed invention has Rm values at or below 2.5%.

However, the ROISIN Declaration rebuts this proposition in stating,

> For the skilled person, a coating which does not lower the reflexion value (per face) to at least 2.5% is not considered an antireflective coating. This 2.5% value is the limit typically considered by skilled persons as characterizing an anti-reflective coating in the International standard ISO/DIS 8980-4 which is presently under discussion for approval.

This information, which is of record, shows that a Rm value of 2.5% per face is the upper limit for considering a coating as having antireflective properties. Also note that since the date of the ROISIN Declaration, the referenced International standard was adopted, as has been made of record in the application family. Likewise it follows that by reciting an antireflective coating in the claims, one of skill in the art recognizes that in order to have this property, the coating must have a Rm value of no more than 2.5% per face even though this value is not expressly stated in the specification.

In addition, applicant disagrees with the characterization of Taniguchi et al. in the final action. Applicant points out that the layer which the Examiner considers to have anti-reflective properties actually degrades the anti-reflective characteristics of the article on which it is deposited, as it has been expressly shown in comparative example 3 of the ROISIN declaration.

Again, as demonstrated in the ROISIN Declaration, the second fluorine-containing organopolysiloxane based film of Taniguchi et al. cannot be considered as an anti-reflective layer by one of ordinary skill in the art. Consequently, there is no disclosure or suggestion in Taniguchi et al. of an impact-resistant primer layer between a hard coat and an antireflective coating.

It should be kept in mind that the data in the ROISIN Declaration is submitted to show that Taniguchi et al. does not render obvious the particular stacking arrangement recited in the claims. The stacking arrangement in Taniguchi et al. does not provide the anti-reflective properties inherent in the claimed arrangement.

It is thus submitted that the Declaration provides objective evidence that the stacking arrangement of the claimed invention provides properties not taught or suggested by Taniguchi et al. Namely, Taniguchi et al. fails to teach or suggest the claimed stacking arrangement as well as the antireflective properties associated with the claimed arrangement. The skilled person cannot find in Taniguchi et al. any motivation for introducing an intermediate impact-resistant primer layer between a hard coat and an antireflective coating. This explains why the ROISIN Declaration is relevant, why reciting 2.5% in the claim is not necessary, why the data is probative, and why the R_m value need not be recited in the claims.

In view of the foregoing, the rejection under §103 should be reversed.

(9) Appendix - - Claims on Appeal

1. (Previously presented): Opthalmic lens consisting of a substrate made of organic glass, of an abrasion-resistant coating, of a layer of impact-resistant primer and of an anti-reflective coating, wherein the surface of the substrate is covered with the abrasion-resistant layer and the anti-reflective coasting, and wherein the abrasion-resistant coating is a silicone based coating or an acrylic based coating.

2. (Original) Lens according to claim 1, wherein the substrate is chosen from

(I) the glasses obtained by polymerization of diethylene glycol bis(allyl carbonate);

(II) the glasses obtained by polymerization of acrylic monomers derived from bisphenol A;

(III) the glasses obtained by polymerization of allyl monomers derived from bisphenol A.

3. (Original) Lens according to claim 1, wherein the substrate is chosen from:

(A) the glasses obtained from poly(methyl methacrylate);

(B) the glasses obtained from polystyrene resin;

(C) the glasses made of resin based on diallyl phthalate.

4. (Original) Lens according to claim 1, wherein the impact-resistant interlayer has an intrinsic Bayer value lower than or equal to 2, at a thickness of 3 μm.

5. (Original) Lens according to claim 1, wherein the impact-resistant primer is a thermoplastic or heat-curable polymer composition which has a solids content ranging from 5 to 20% by weight relative to the total weight of the primer composition.

6. (Original) Lens according to claim 1, wherein the thickness of the impact-resistant interlayer in the cured state is between 0.2 and 1 μm.

7. (Original) Lens according to claim 1, wherein the composition of the impact-resistant primer consists of a thermoplastic polyurethane resin obtained by reaction of a diisocyanate with a compound comprising a reactive hydrogen at each end.

8. (Original) Lens according to claim 1, wherein the composition of the impact-resistant primer consists of a heat-curable polyurethane resin obtained by reaction of a blocked polyisocyanate and of a polyol.

9. (Original) Lens according to claim 1, wherein the composition of the impact-resistant primer consists of a copolymer of acrylic and/or methacrylic monomers and of aromatic vinyl compounds.

10. (Original) Lens according to claim 1, wherein the composition of the impact-resistant primer consists of a polysiloxane.

11. (Original) Lens according to claim 10, wherein the composition of the impact-resistant primer contains in a solvent medium, one or a number of silane hydrolysate(s) with an epoxy group containing at least one Si-alkyl group and containing no fillers.

12. (Previously presented) Lens according to claim 1, wherein the hard abrasion-resistant coating is obtained by curing a composition containing:

a) colloidal silica which has a mean particle diameter of between 1 and 100 mμm;

b) a solvent;

c) a hydrolysate or a mixture of hydrolysates of silane compound(s) of formula:

$$R^1 - \underset{|}{\overset{R^3 a}{}}\!\!\!\!Si - (OR^2)_{3-a} \qquad (\alpha)$$

in which:

R^1 denotes an organic group containing an epoxy group;

R^2 is a hydrocarbon radical which has 1 or 2 carbon atoms;

R^3 is a hydrocarbon group which has from 1 to 4 carbon atoms, and a is 0 or 1 in value.

13. (Original) Lens according to claim 1, wherein the thickness of the abrasion-resistant layer, in the cured state, is between 1 and 15 μm.

14. (Previously presented) Lens according to claim 12, wherein the composition of the abrasive-resistant coating has a colloidal silica content of between 0 and 40% by weight in the solids content.

15. (Original) Lens according to claim 1, wherein the anti-reflective coating consists of a mono- or multiplayer film based on dielectric materials and deposited by vacuum deposition.

16. (Original) Lens according to claim 1, successively including:

a) a substrate made of glass obtained by polymerization of diethylene glycol bis(allyl carbonate);

b) a hard abrasion-resistant coating obtained by curing a composition containing, in methanol, colloidal silica and a hydrolysate of γ-glycidyloxypropylmethyldiethoxysilane;

c) an impact-resistant interlayer obtained by curing a composition containing, in methanol, a hydrolysate of γ-glycidyloxypropylmethyldiethoxysilane or of γ-glycidoxypropyltrimethoxysilane;

d) a multiplayer anti-reflective coating.

17. (Previously presented) Lens according to claim 1, successively including:

a) a substrate made of glass obtained by polymerization of diethylene glycol bis (allyl carbonate);

b) an abrasion-resistant coating obtained by curing a composition containing, in methanol, colloidal silica and a hydrolysate of γ-glycidoxypropylmethyldiethoxysilane;

c) an impact-resistant interlayer obtained by curing a composition containing 4,4'-dicyclohexylmethane diisocyanate and polyethylene glycol;

d) a multiplayer anti-reflective coating.

18. (Original) Process for the manufacture of an ophthalmic lens as defined in claim 1, comprising:

- applying the abrasion-resistant coating onto the surface of the organic glass substrate;
- depositing the layer of impact-resistant primer is deposited onto the abrasion-resistant layer; and
- depositing the anti-reflective coating is onto the impact-resistant primer.

19. (Original) Process according to claim 18, wherein the abrasion-resistant layer and the layer of impact-resistant primer are deposited by centrifuging, by dipping or by spraying and in that the anti-reflective coating is applied by vacuum deposition or sol-gel deposition.

20. (Original) Process according to claim 18, wherein the abrasion-resistant and impact-resistant primer layers are pretreated using a surface activation treatment by a chemical or physical route.

21. (Original) Process according to claim 20, wherein the surface activation treatment is an alkaline chemical etching, an oxygen plasma treatment or an ion bombardment in a vacuum vessel.

22. (Previously presented) Lens according to claim 1, wherein the abrasion-resistant coating contains one or more mineral fillers for increasing the hardness or the refractive index or both of the abrasion-resistant coating.

23. (Previously presented) Lens according to claim 2, wherein the mineral fillers are selected from the group consisting of silicone, titanium dioxide, antimony oxide and mixed oxides.

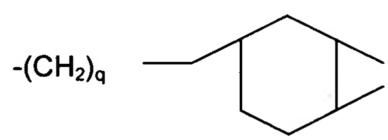
24. (Previously presented) Ophthalmic lens consisting of a substrate made of organic glass, of an abrasion-resistant coating, of a layer of impact-resistant primer and of an anti-reflective coating, wherein the surface of the substrate is covered with the abrasion-resistant coating and in that the impact-resistant primer layer is inserted between the abrasion-resistant layer and the anti-reflective coating, and_wherein the abrasion-resistant coating is an epoxysilane hydrolysate based coating.

25. (Previously presented) Lens according to claim 12, wherein R^1 is an organic group containing an epoxy group of formula:

$$-(CH_2)_P-(OCH_2CH_2)_r-OCH_2\text{-}\underset{\diagdown\ \ O\ \ \diagup}{CH\text{-}CH_2}$$

where p is 1 to 6 and r is 0 to 2.

26. (Previously presented) Lens according to claim 12, wherein R^1 is an organic group containing an epoxy group of formula:



where q is 1 to 6.

(10) <u>Conclusion</u>

In view of the comments above, it is submitted the Examiner erred in rejecting the claims on appeal. Appellant therefore respectfully requests that this Honorable Board reverse the Examiner's rejection of the claims.

Respectfully submitted,

Robert M. O'Keefe
Registration No. 35,630
Attorney for Applicant

O'KEEFE, EGAN & PETERMAN
1101 Capital of Texas Highway South
Building C, Suite 200
Austin, Texas 78746
(512) 347-1611
FAX: (512) 347-1615

FTG Software Associates
Princeton, New Jersey

FilmStar Optical Thin Film Software is a suite of *Windows* programs for designing, manufacturing, and measuring optical thin film coatings. Optical coatings are usually applied to glass and other surfaces by high vacuum deposition. Applications range from decorative coatings in the Swarovski crystal collection to spectroscopic filters in the MODIS satellite.

Scantraq

Scantraq Spectrophotometer Software, is a standalone version of FilmStar MEASURE for chemists working in UV/VIS/IR spectroscopy.

FilmStar DESIGN Free Version ...designs and optimizes optical thin film devices.

Film Thickness Module ...computes thickness of 'thick' thin films which exhibit fringe structure in reflectance or transmittance

Inficon IC/5 Datalogger ...downloads process data via RS-232 during deposition

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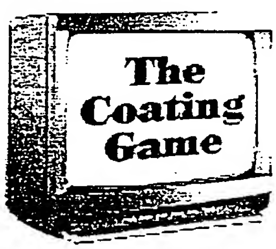
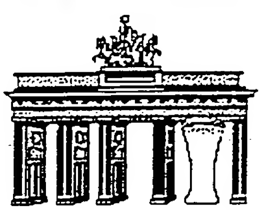


A new TV series about engineers in Santa Rosa? Well, not exactly.

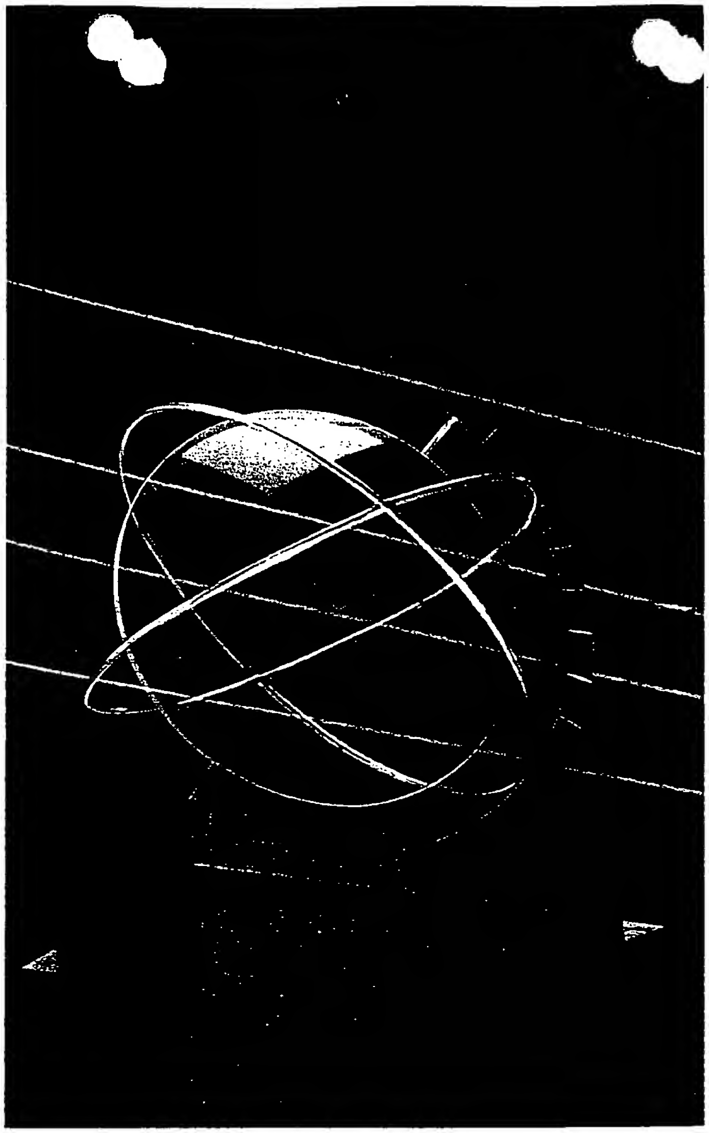
The Coating Game is a technician-friendly virtual coating machine for developing and improving manual optical monitoring skills. The program pays for itself very quickly with fewer test runs and ruined parts. After all, if you blow a coating run in the Coating Game, it doesn't matter much...just start over.



See us at the Europto ***International Symposium on Optical Systems Design and Production***, Berlin Technical University, May 25-28, 1999. Meet with us and learn how FilmStar can contribute to your success in optical thin films.

Until then, please visit our Berlin Page for information and cool links.

Last updated on May 13, 1999



OPHTHALMIC
OPTICS
FILES

Coatings

ESSILOR

Advancing Coating Technology since 1952

FILM STAR

FTG Software Princeton, New Jersey

Optical Thin Film Software

FilmStar[tm] is a powerful and easy-to-use suite of Windows programs for designing, manufacturing, and measuring optical coatings.

FilmStar Program List	Development Modules	Contact FTG Software

---

FilmStar Program List

FilmStar includes 16 and 32-bit versions. 32-bit versions are supported on Windows 95/98/NT.

DESIGN	Designs and optimizes optical thin film coatings. A *Free Version* with fixed indices is available.
INDEX	Maintains dispersive index files and functions
MONITOR	Converts designs to optical monitor settings
CRYSTAL	Uploads designs to Inficon and Sycon deposition controllers
MEASURE	Controls and acquires data from spectrophotometers. This program is also marketed to chemists as Scantraq for Windows.

Get Acrobat Reader

A five page brochure FilmStar Optical Thin Film Software (159K) can be downloaded and printed. This is in Adobe Acrobat 3.0 (.pdf) format. Click the logo at the left to download the free Acrobat Reader.

FilmStar Development Modules

While many users just operate FilmStar from its user-friendly menus and dialog boxes, FilmStar contains a number of programmable modules. Since these modules are utilized throughout FilmStar, they are discussed in separate pages.

FilmStar BASIC	A BASIC interpreter with familiar syntax nearly 100% compatible with *Microsoft* VBA.
The Workbook	An Excel-compatible spreadsheet for calculating and optimizing spectral functions.
FSPlot Module	Publication-quality graphs for calculated and measured spectra
Report Generator	Previews and prints reports combining text, calculated results, and graphics.
FilmStar Database	Sorts and select designs and spectral data files.
DDE & Automation	Integration with other Windows applications

These modules work together. For example, a report generated by BASIC and printed in the report generator can include workbook calculations. There are numerous benefits:

- Entire coating design catalogs can be printed automatically.
- Macros can be run *during* optimization. As an example, it is possible to design CIE color coatings where the specification includes two illuminants incident from opposite directions.
- Users can select measured data files with industry-standard SQL commands and automatically run programs to examine spectral yields over a period of time.
- Users can evaluate quantities not originally in the program, such as group velocity dispersion.
- Engineers with moderate programming skills can set up one-button processes for coating technicians. This is especially crucial in quality-control.

Supplementing its built-in programmability, FilmStar is highly integrated with other Windows applications via DDE (dynamic data exchange) and 32-bit Automation. Many data types can be imported and exported. DESIGN and MEASURE can receive commands from Excel, Labview and many other Windows applications.

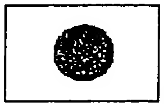
For further information please contact

Fred Goldstein
FTG Software Associates
P.O. Box 579
Princeton, NJ 08542 USA
Tel (609) 924-6222
Fax (609) 924-5169
E-mail info@ftgsoftware.com

In France please contact

Sabatino Cohen
C.S. Developpements
1, Rue Madeleine Crenon
92330 Sceaux

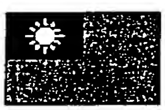
Tel (01) 43.50.32.55
Fax (01) 46.60.28.52
E-mail pcabeza@club-internet.fr


In Japan please contact

Mitsunobu Kobiyama
Tecwave Corporation
NS Iwamoto Bldg.
1-4-5, Iwamoto-Cho, Chiyoda-Ku
Tokyo 101
Tel 03-3851-4601
Fax 03-3851-4611
E-mail GHA07770@niftyserve.or.jp


In Korea please contact

H. K. Kim
Hyun Young Corporation
Deawha Plaza Bldg.
4-12 Woo Myeon Dong, Seo-Cho Ku
Seoul 137-140
Tel 02-575-0535
Fax 02-576-0405
E-mail hyc58@unitel.co.kr


In Taiwan please contact

Infotek Information Systems
3F, No. 17-1, L-128
Chong-Shan N. Rd., Sec 2, Taipei 104
Tel 02-523-5377
Fax 02-511-2360
E-mail info@infotek.com.tw
Web (Chinese language) www.infotek.com.tw

Last updated on February 09, 1999

FilmStar DESIGN

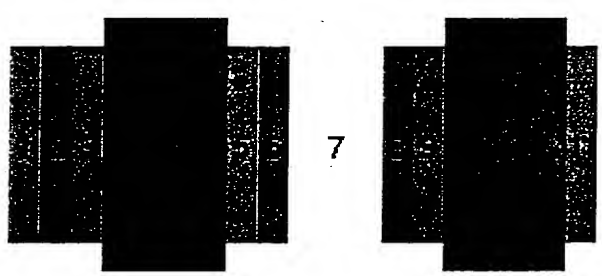
The FilmStar DESIGN Free Version is a powerful and useful implementation with the limitation that film indices are fixed. Since the values are realistic and even include dispersive Ag and Al, the Free Version may be all that is required for many purposes.

Thin Film Design - Virtually any number of repeated layer groups (fast calculation algorithm) and separate layers. Optical, physical and massive layer thicknesses. Rugates, mathematical operations, Herpin replacement, optical to physical thickness conversion, groups to layers conversion, reverse design, inhomogeneous layer simulation, tooling factors, math functions, etc. Up to 52 film materials in a design.

In addition to two design editors, a design macro facility, with angle and wavelength matching, combines designs into filter assemblies. Up to six designs can be loaded from disk, edited, matched, and combined into an assembly.

Film Indices - Constants, dispersive look-up tables, and absorbing functions of wavelength with up to seven coefficients (created and maintained in FilmStar INDEX). Built-in functions include Buchdahl, Cauchy, Lorentz, quadratic, Sellmeier, mixed materials, etc. Users may add up to 20 new functions in a built-in equation editor, in the FilmStar Workbook, in Microsoft Excel or in other Windows languages. These functions ultimately appear as if built into DESIGN. Using inverse synthesis techniques, coefficients are determined from measured spectral data.

Substrate Compensation - Exact correction (addition of intensities for incoherent light sources) for substrate surfaces for forward and reverse light incidence. Substrates can be treated as massive layers; this allows evaluation and optimization in systems containing multiple absorbing substrates and air spacers with thin films on all surfaces.



FilmStar DESIGN supports any number of massive layers

Calculated Quantities - [%R, %T, O.D., phase] vs. [wavelength (nm, microns, Angstroms, 1/cm), angle or thickness]. Other modes: electric field, total/partial/differential absorptance, CIE color (including tolerancing), ellipsometry, Herpin indices, contour graph. Spectral data is stored in two standard ASCII formats: .csv (comma separated values) and .dx (J-CAMP 4.24 spectroscopy format). Results can be copied to the Windows clipboard and transferred to other programs via DDE.

System Performance - Virtually any combination of sources, filters and detectors can be evaluated in the FilmStar Workbook spreadsheet. This includes a tolerancing module for estimating coating yields.

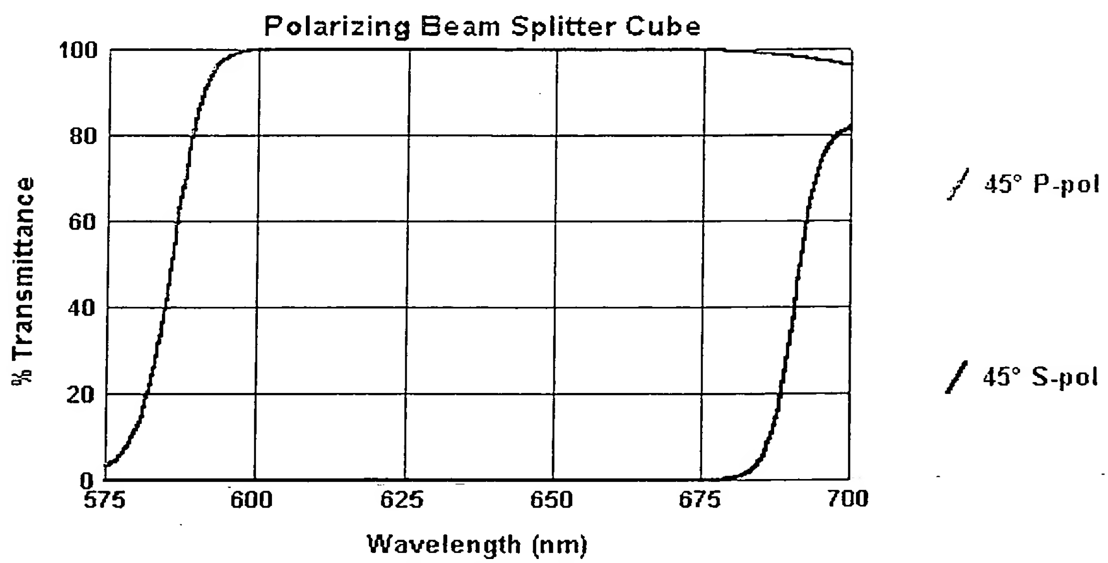
Optimization - Refinement using DLS, Levenberg-Marquardt, simplex, and gradient methods. Optimization targets at multiple wavelengths and angles include %R, %T, phase, ellipsometric Psi/Delta, etc. Targets can be automatically generated over ranges of wavelengths and angles and/or imported from Windows programs. A CIE color module provides straightforward color optimization without having to specify any particular spectrum.

Using FilmStar gradient methods it is not necessary to define traditional optimization targets. Instead, general merit functions and constraints are defined in Workbook cells. This is extremely powerful and makes it possible for thin film engineers to attack entirely new problems. (Although championed by Dobrowolski, the idea of general merit functions does not seem to have taken hold within the optical thin film community.)

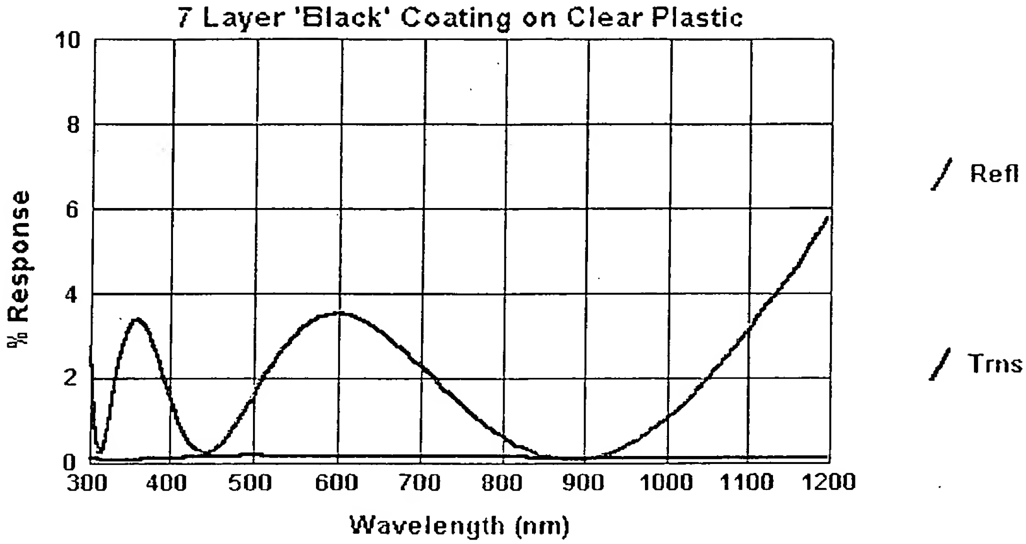
Get Acrobat Reader

A paper Constrained Optimization with User-Specified Functions (94K) presented at the OIC 1998 meeting in Tucson can be downloaded and printed. This is in Adobe Acrobat 3.0 (.pdf) format.

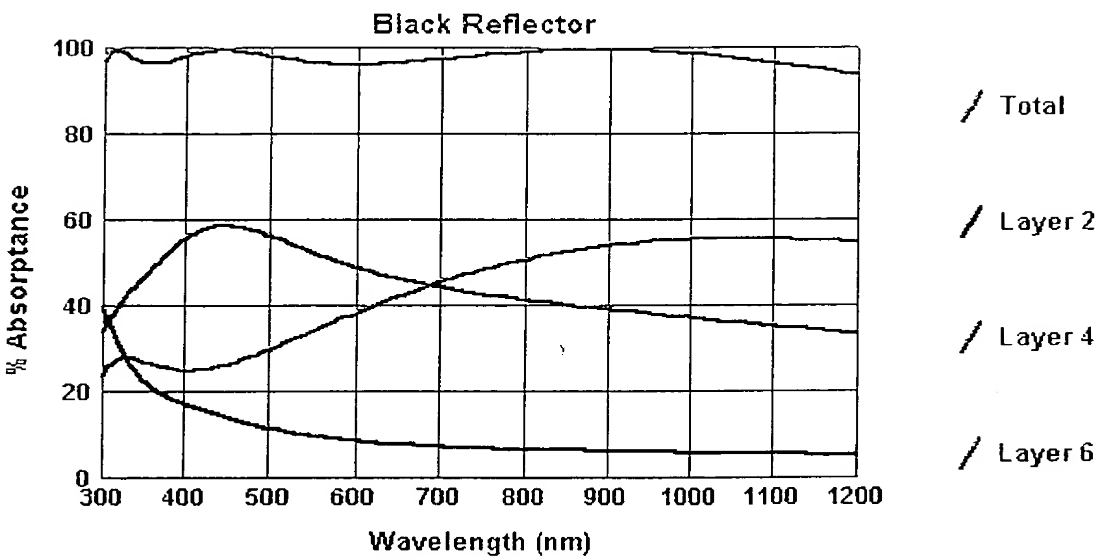
Measured spectra, from FilmStar MEASURE or other sources, can be converted into targets for inverse synthesis. In Dobrowolski's method of inverse synthesis, optimization targets are measured spectral data; the starting design is the theoretical design and the final design gives actual indices and thicknesses. Optimization variables include optical, physical and massive layer thickness, dispersive index functions, and film material tooling factors.



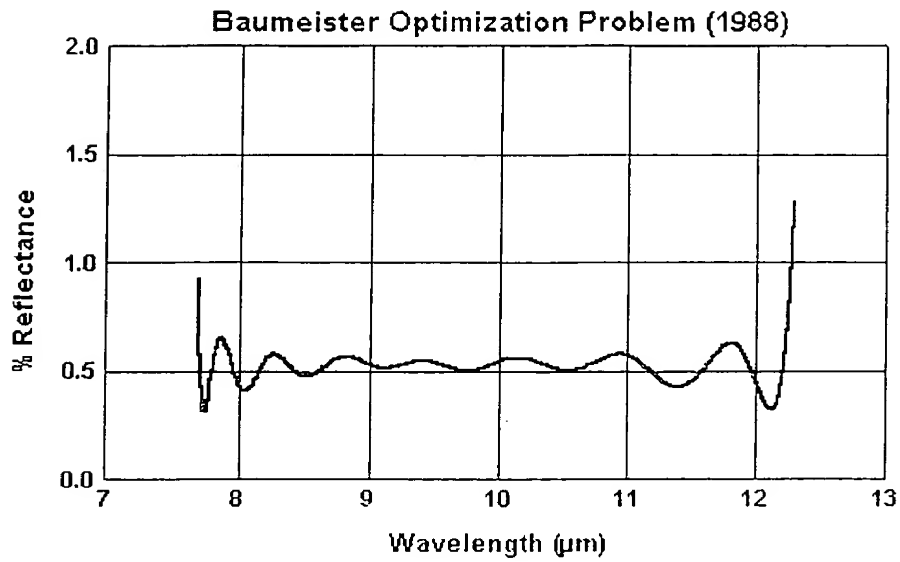
Optimized polarizing beam splitter cube



Synthesized 'black reflector' coating

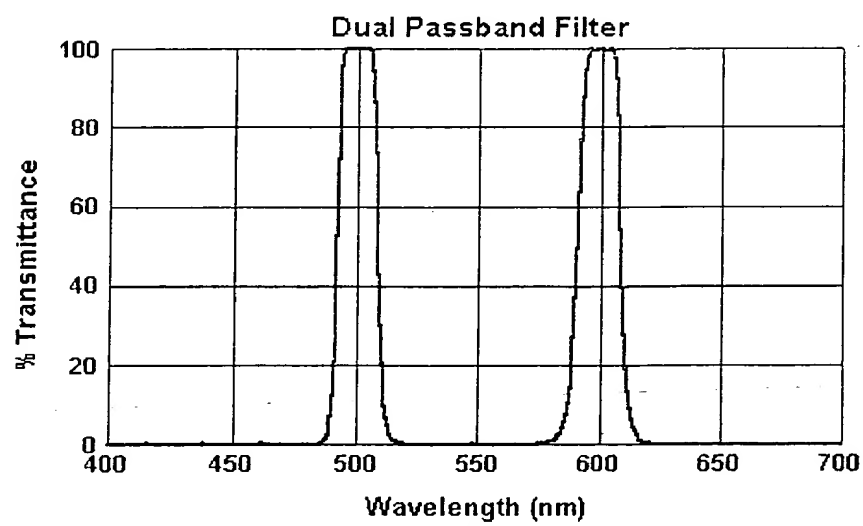


Absorptance in 'black reflector' metallic layers



AR coating on germanium 7.7 - 12.3 microns
(P. Baumeister et al, Applied Optics, 15 July 1988)

Synthesis -Excellent results are often obtained with synthesis: the design of coatings where a starting design is not known. During optimization 'needles' and other additional layers are inserted.



Dual passband filter designed with needle synthesis and refinement

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FilmStar Program List | Development Modules | Contact FTG Software

Last updated on October 30, 1998

COATINGS

This volume of the Ophthalmic Optics Files presents a study of the Coatings applied to ophthalmic lenses. By "Coatings", we mean all manufacturing procedures and the resultant products designed to enhance the performance of ophthalmic lenses, independent of their power. This File is divided into three parts :

I - tinting (in the broadest sense of the word), including photochromism and special filters,

II - protection against abrasion,

III - antireflection coating and associated anti-tarnish coating.

Each part consists of an analysis of the specific function of each type of coating, and a description of the technology used to meet the given objectives.

It is important to retain a global view of the ophthalmic lens. Indeed, this is an increasingly complex product because of the combination of diverse Materials and Coatings, which are being more and more often integrated into the manufacturing process (figure 1). Consequently, coatings are gradually being considered not so much as optional "extras", but rather as essential lens components. Indeed, the emphasis is on a greater interaction between the various components to obtain the final performance of the lens. For an overview of the general structure of modern lenses, we thus recommend reading of the Ophthalmic Optics File on "Materials".

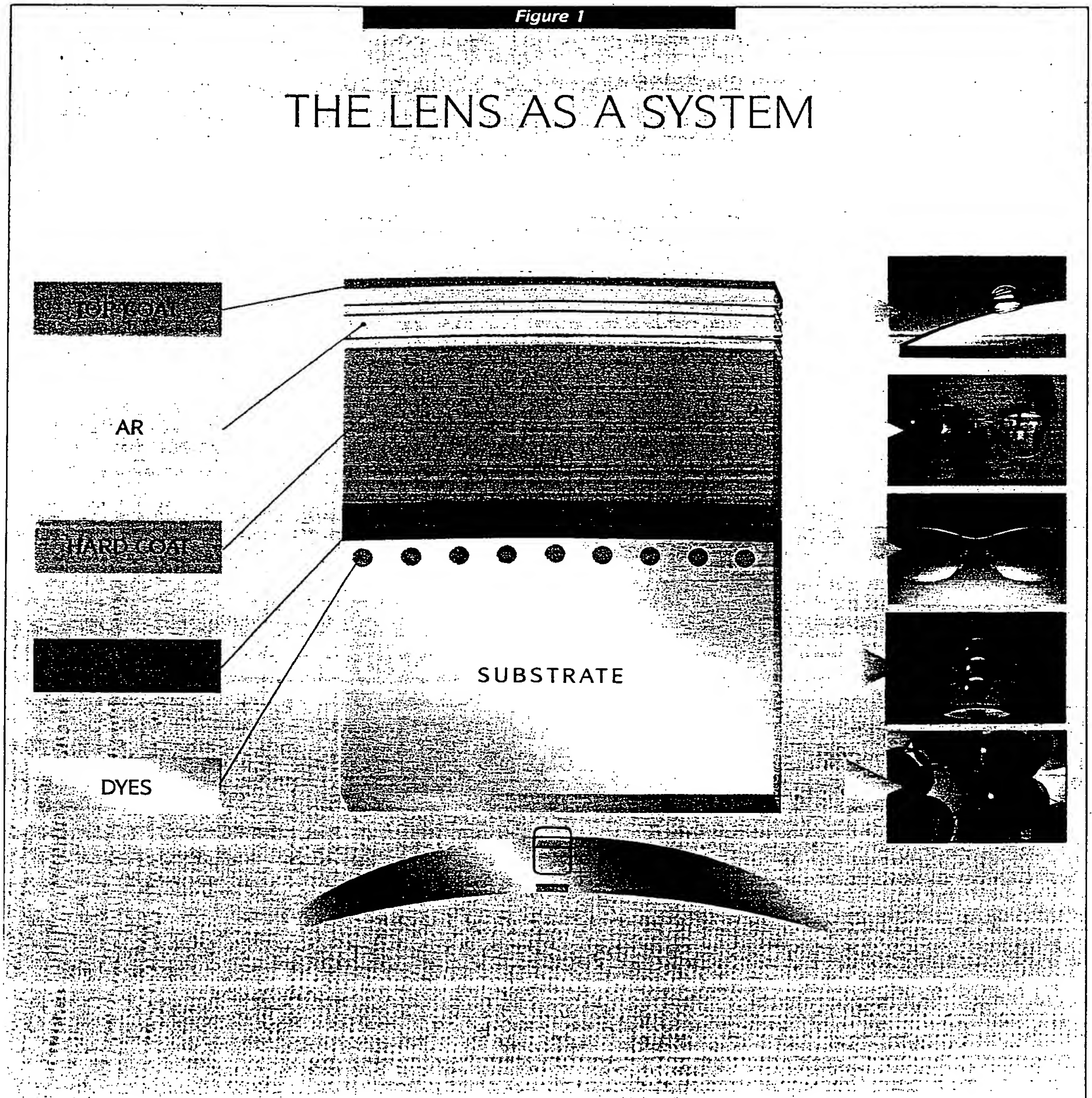


***Figure 1** : A coated plastic lens is a complex system.*

3/ Specification and performance of antireflection coatings

a) Specification of the antireflection effect

The antireflection function is represented by a graph showing intensity of reflected light (ordinate) as a function of wavelength (abscissa). This set of data is called a "reflection graph" or "spectrogram R (λ)". The reflection graph of an uncoated lens is the reference, and allows the antireflection efficiency factor to be calculated as the ratio of the areas located under each of the two curves.

Figure 27

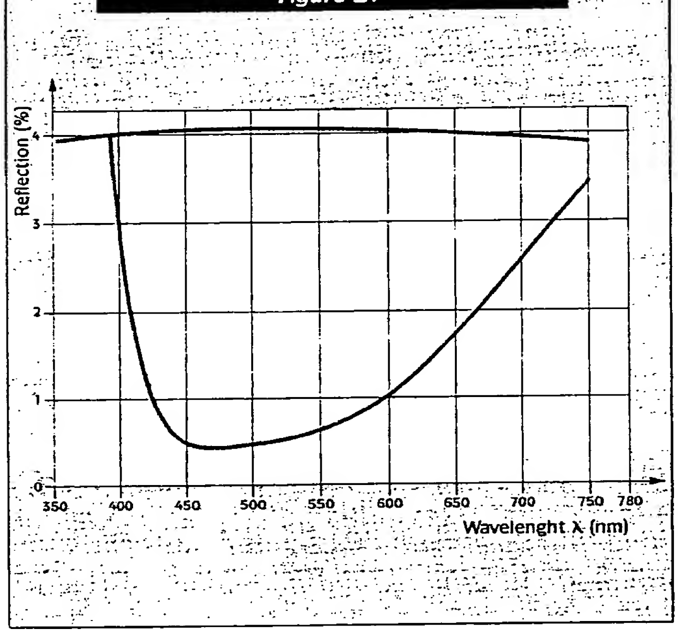


Figure 27 : Antireflection coating reflection graph.

b) Optimization of performance

The antireflection coating represented in figure 27 does not cancel out reflections completely. It allows some luminous reflection, depending on the wavelength : while this is minimal at about 460 nm, it is much greater at the two extremities of the spectrum. To improve the efficiency of antireflection coatings, physicists have refined the principle of light interference described above by calculating the thickness and refractive index of several stacked layers (up to 7 or 8), such that multiple interferences of the waves reflected on these layers taken two by two substantially reduce reflection at different points of the visible spectrum.

The efficiency of these multilayer stacks is spectacular (see figure 28), and their application is developing fast, despite the complexity of designing such systems. Generally speaking, antireflection coatings available on the market can be classified into three categories :

Type of antireflection coating	Reflection per surface, ρ	Total transmission, τ
Standard efficiency	1.6 to 2.5 %	95 to 97 %
Medium efficiency	1,0 to 1.8 %	96 to 98 %
High efficiency	0.3 to 0.8 %	98 to 99 %

c) Antireflection coating residual color

Figure 27 shows that the amount of reflected light is higher with wavelengths in the blue (400 nm) and red (700 nm) part of the spectrum. This residual colored reflection, essentially consisting of blue and red light, gives the lens a well-known "purple" appearance.

Figure 28 shows two graphs which do not have exactly the same shape throughout the spectrum, but which are characterized by a very low amount of reflected intensity : one might therefore expect the residual color to be fairly similar. In fact, this is far from true : the lenses corresponding to these two real curves were fitted to a pair of spectacles (figure 29) which proved unacceptable for cosmetic reasons. Indeed, the two lenses could under no circumstances constitute a pair.

In conclusion, residual color represents one of the important characteristics of antireflection coating, as it affects perception of the product quality, and the wearer's final choice. It is therefore necessary to be able to control this phenomenon, both at the design phase, and during manufacturing. For this reason, scientific tools have been developed to allow the calculation of residual color to be deduced from a spectrogram R(λ). This measurement has been defined in the "CIE L*a*b*" colorimetric system for instance (see supplement section p. 28).

Figure 28

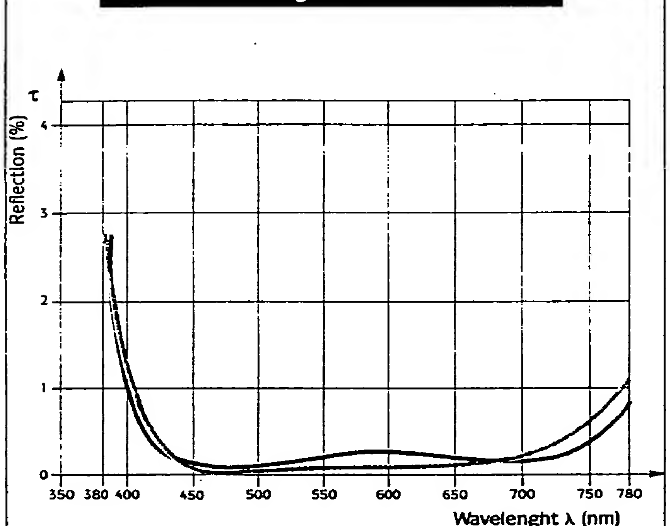
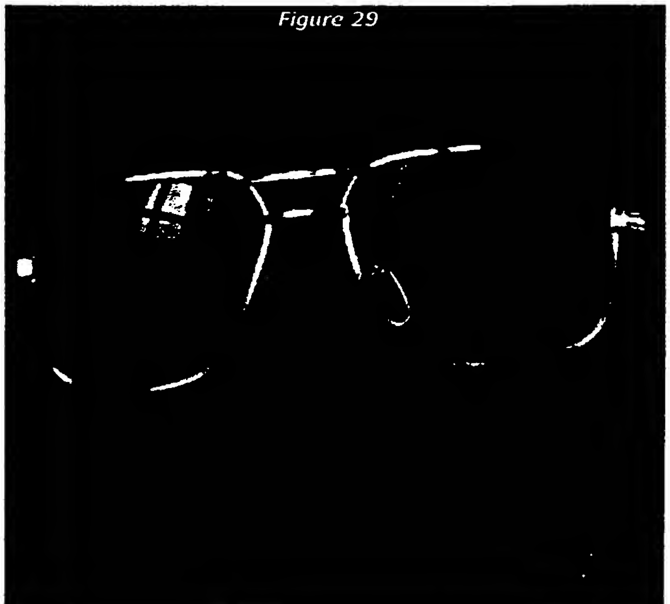


Figure 29



B/ The technology of antireflection coating

1/ Vacuum evaporation : the reasons for this choise

The manufacturing technology for antireflection coatings consists of stacking thin layers with specific characteristics to achieve the overall result. These characteristics are :
- specified refractive index,
- absolute transparency,

and the method implemented to obtain the required configuration :
- high precision layers of even thickness,
- excellent adherence to the lens,
- outer surface coating as polished as the uncoated lens,
- optical qualities equal to that of the substrate : no isolated defects caused by dust ("pinholes"), no "haze" effect due to scattering, no pitting due to a material deficit ("bubbles"), etc.

Only one technology currently provides a satisfactory solution to all these requirements. This is vacuum evaporation. Why ?
- evaporation allows very pure materials to be applied to lenses by condensation; the chemical composition of these materials can be rigorously controlled ;
- vacuum evaporation allows layers to be built up with the required accuracy, however thin they may be (± 5 Å) ;
- the vacuum technique guarantees optimal adherence, as the lens-layer interface is free from any residual contamination.

***Figure 28** : Reflection graph for two high efficiency multilayer coatings.*

***Figure 29** : Difference in appearance of two multilayer AR coated lenses (right lens - red line, left lens - green line).*

CONCLUSION

Market surveys carried out in several countries clearly show the interest for lenses with "all-in-one" coatings or "integrated coatings" ; such lenses correspond best to the wearer's expectations, as they offer multiple advantages without raising the awkward question of options.

Antireflection coatings are recognized by consumers as a determinant factor for comfort and appearance. Similarly, anti-tarnish coatings have brought about a dramatic improvement in the cleaning of coated lenses, even though further research is required to definitively rule out this problem. Finally, the increased market share for high-index lenses implies substantial future growth in the area of anti-abrasion coatings.

These different needs allow us to conclude that coatings have a bright future. They are becoming fully fledged lens constituents, and their success has been proved throughout the world. Although their use varies from one country to the next, there is however a clear overall upswing. Hence, lens coatings are bound to assume an increasingly important place within the general economy of ophthalmic lenses.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of
J.P. CANO et al,
Serial No. 08682,602 Group Art Unit 1773
Filed: December 16, 1996 Examiner : Nakarani D.

For: OPTHALMIC LENS MADE OF ORGANIC GLASS WITH SHOCK PROOF INTERMEDIATE LAYER, AND METHOD FOR MAKING SAME

DECLARATION PURSUANT TO 37 CFR 1.132

I, Philippe ROISIN, declare:

That I am a French citizen residing at, LES ULIS - FRANCE

That I have been awarded:

a Master of Science, University of Kent at Canterbury (physics-Chemistry (1990/1991),

DESS IMPCA (Instrumentation and methods in physico-chemical analysis) Faculté d'Orsay Université Paris II (1991/1992).

That I am currently employed as engineer of the R and D Department, materials, thin layer group of ESSILOR INTERNATIONAL (COMPAGNIE GENERALE D'OPTIQUE) where I have been employed since 1994, and I am more particularly in charge of studies on optical characterization and anti-reflective optical treatments.

That I have read and am familiar with the United States patent application SN 08/682,602 filed on December 16, 1996 for: OPTHALMIC LENS MADE OF ORGANIC GLASS WITH SHOCK PROOF INTERMEDIATE LAYER, AND METHOD FOR MAKING SAME.

That I have read and am familiar with the prior art references cited by the Examiner and more particularly US-4,904,525 (TANIGUCHI et al).

1/ Tests

That I have modelized the stackings shown in annex 1 using commercial software "Film Star Design" of FTG Software Associates-Princetown New Jersey.

This modelization software is commonly used since many years.

Calculations were made using a light beam having an incident angle of 15°.

The modelized stackings were the following:

Stacking 1: corresponds to a reference stacking comprising a substrate and a hard coat according to example 1 of Taniguchi et al but without the anti-reflective coating.

Stacking 2: corresponds to the stacking of example 1 of Taniguchi et al and comprises: substrate / hard coat / top film (anti-reflective film).

This stacking is said to have an experimental transmission of 96.1%.

Stacking 3: comprises substrate / hard coat / top coat of fluorosilicone (anti-reflective coating) / second fluorine containing organopolysiloxane based film (antistatic coating). Three thicknesses of the antistatic film were considered, namely 1(a), 15(b) and 30(c) nm.

Stacking 4: comprises substrate / hard coat / second fluorine containing organopolysiloxane-based film (antistatic film). Three thicknesses of second fluorosilicone film were considered, namely 1nm (a), 15nm (b) and 30nm (c).

Refractive index value of the second fluorosilicone film was estimated from F/Si ratio of 0.04/1.

2/ **Results**:

For each stacking, mean reflexion values R_m (per face) (for the entire visible spectrum 400-700nm) and mean transmission value T_m were determined assuming that the two major faces of the substrate were coated with the corresponding layers.

	1	2	3			4			S
			a	b	c	a	b	c	
R_m (%)	5.06	1.30	1.31	1.63	2.28	5.06	4.85	4.24	5.47
T_m (%)	89.87	97.40	97.38	96.74	95.43	89.87	90.30	91.52	89.06

S corresponds to an uncoated substrate.

For the skilled person, a coating which does not lower the reflexion value (per face) to at least 2.5% is not considered as an antireflective coating. This 2.5% value is the limit typically considered by the skilled persons as characterizing an anti-reflective coating.

This value is the value that has been selected for defining an anti-reflective coating in the International standard ISO/DIS 8980-4 which is presently under discussion for approval.

3/ **Conclusion**

In view of the above results, it appears:

• second fluorosilicone film (antistatic coating) cannot be considered as an antireflecting coating since all stackings 4) including only the hard coat and the second fluorosilicone film have R_m values per face (namely at least 4%) much higher than 2.5% which is the upper limit value for considering the coating as having antireflective properties. Furthermore, stacking 3 shows that the presence of the second

fluorosilicone film (antistatic) deteriorates the antireflective properties of the underneath antireflective top coating.

The fact that for stacking 2 (example 1 of the reference) the claculated value of T_m (97.4%) is higher than the experimental value (96.1%) given in the reference shall not be surprising. In fact, there always exists slight variations since the actual stacking is ususally not perfect contrary to modelized stackings. Further, modelized calculations were effected using an incident angle of 15° and integrating over the full 400-700nm range. In the reference, other conditions may have been used.

Nevertheless, the above stacking modelization gives a meaningful comparison of the properties of the different stackings.

The antistatic second fluorosilicone film of the reference is not an antireflective coating. In the reference, the antireflective properties are attributable to the first fluorosilicone top coat.

I further declare that all statements made herein of my own knowledge are true and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful statements may jeopardize the validity of the application or any patent issuing thereon.

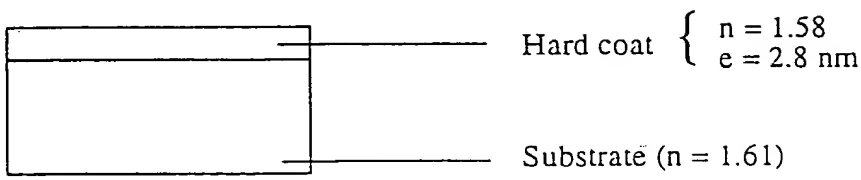
January 19, 1999

DATE

SIGNATURE

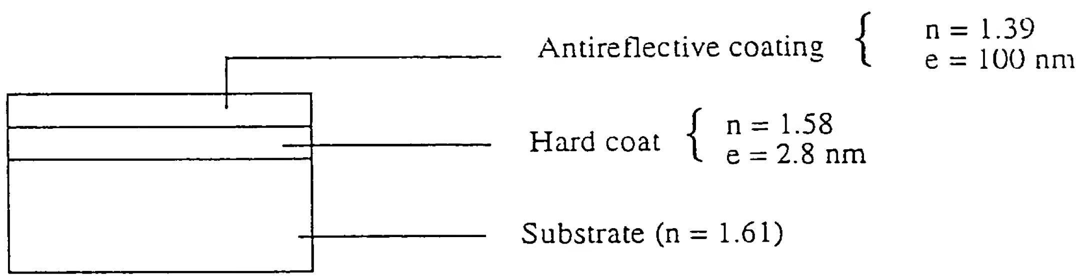
ANNEX 1

STACKING 1

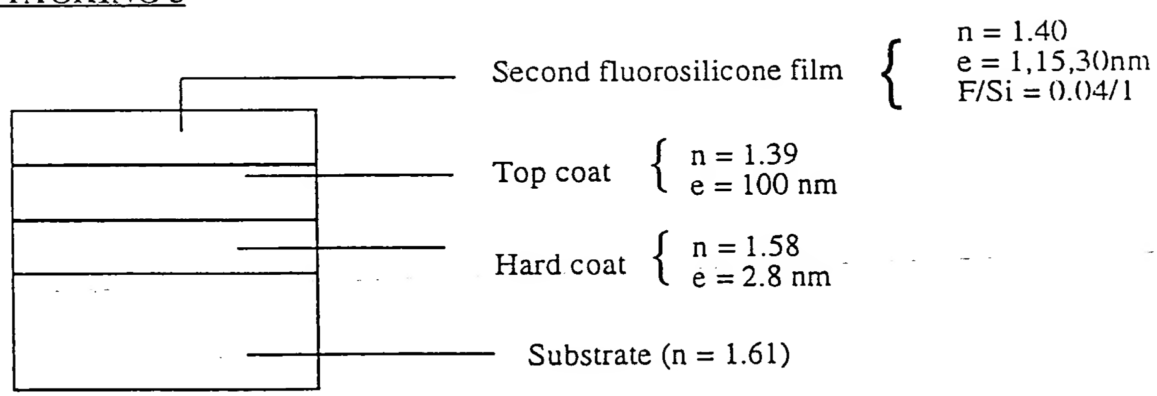


STACKING 2

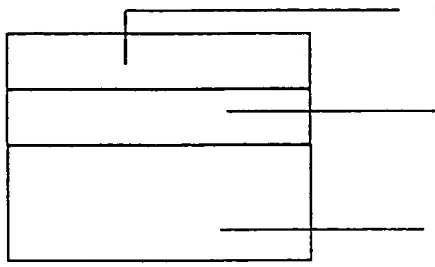
(Example 1 of Taniguchi et al)



STACKING 3



STACKING 4



Second fluorosilicone film { n = 1.40, F/Si = 0.04/1, e = 1,15,30nm

Hard coat { n = 1.39, e = 100 nm

Substrate (n = 1.61)

e = thickness of layer